THE EFFECT OF YOGA ON PREMENSTRUAL SYMPTOMS: A NARRATIVE REVIEW FROM A PHYSIOLOGICAL PERSPECTIVE

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ABSTRACT

INTRODUCTION

The primary concerns regarding menstrual disorders are premenstrual syndrome (PMS) and premenstrual dysphoric disorder (PMDD), both characterized by troubling physical and psychological changes during the luteal phase of the menstrual cycle that can disrupt daily activities. This narrative review suggests that yoga is a beneficial non-pharmacological intervention that alleviates PMS and PMDD symptoms through the regulation of the nervous and endocrine systems.

MATERIAL AND METHODS

This article synthesizes from extensive review and analysis of the available literature from Google Scholar, ScienceDirect and PubMed using keywords premenstrual syndrome (PMS), premenstrual dysphoric disorder (PMDD), Hypothalamic–Pituitary-Adrenal Axis (HPA), menstrual pain, and Yoga.

RESULTS

The scientific literature strongly supports the yogic practics as a simple, safe and cost-effective harmonious therapy for managing PMS and PMDD. By intermingled physical postures, breathing exercise, and meditation, Yoga offers a holistic approach that targets the underlying physiological and psychological factors causing PMS and PMDD, eventually strengthening the women's quality of life.

CONCLUSION

Menstruation is a natural event but many women experience PMS and PMDD during their reproductive years. Practicing Yoga regularly has positive impact on PMS and PMDD. This review after extensive literature overview concludes that yoga can enhance women's quality of life and serve as an alternative to medications.

KEYWORDS

Hypothalamic–Pituitary-Adrenal Axis (HPA), Menstrual pain, Premenstrual Dysphoric Disorder (PMDD), Premenstrual Syndrome (PMS), and Yoga

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INTRODUCTION

Premenstrual syndrome (PMS) is identified as a pattern of recurrent moderate psychological and physical symptoms that arise in the late luteal phase of menstrual cycles and resolve during menstruation. Conversely, premenstrual dysphoric disorder (PMDD) is a more severe manifestation of PMS that affects a significant number of women of reproductive age around the globe. PMDD is characterized by a variety of affective, cognitive, behavioral and somatic symptoms. Both PMDD and PMS have detrimental effects on work attendance, productivity and relationships.[1] The American College of Obstetricians and Gynecologists (ACOG) recognizes physical and mental symptoms in its characterization of premenstrual syndrome (Table 1).[2]

Table 1. Most prevalent symptoms of premenstrual syndrome.

Behavioral Symptoms	Somatic (Physical) Symptoms	Affective (Psychological) symptoms
Insomnia	Abdominal bloating	Depression
Overeating	Nausea	Confusion
Sexual dysfunction	Abdominal Pain	Mood swing
Dizziness	Weight gain	Irritability
Angry out	Headache	Restlessness
	Swollen ankles, hands and feet	Forgetfulness
	Muscle and joint pain	Nervousness
	Breast tenderness	Anxiety
		Agitation
		Social Withdrawal

Premenstrual dysphoric disorder (PMDD) is defined in Diagnostic and Statistical Manual of Mental Disorders. 5th ed. (DSM-5) as a severe presentation of PMS marked by at least five affective, cognitive and somatic symptoms seen in late luteal period, disappearing shortly after menstruation, and leading to significant functional impairment, with prospective confirmation over at least two cycles.[3] Symptoms can present at any stage between menarche and menopause. The disease burden is often substantial; women with PMS frequently experience increased work absences, higher healthcare cost, and a lower quality of life associated with health. Research show that premenstrual symptoms can range in severity from mild to severe, affecting over 90% of women of reproductive age, PMDD affects 2-8% of these women and PMS affects 20-40 % of them.[4] Furthermore, it appears that the prevalence of this syndrome differs across cultures and ethnic groups,[5,6] although such variations are not consistently observed, as evidenced by research involving females of European, East Asian and South Asian descent.[7] Therefore, country-specific investigations into prevalence are essential for a thorough and precise assessment of the syndrome's occurrence.[8] A decrease in progesterone levels in the late luteal phase can induce changes gamma-aminobutyric acid (GABA) and its metabolites, thereby contributing to PMS and PMDD symptoms. The impact of estrogen and progesterone on the serotonin, GABA and dopamine systems could be responsible for mood fluctuations.[9] These hormones may also influence the renin-angiotensin-aldosterone system, potentially explaining some of the swelling and bloating experienced during the luteal phase.

The women with PMS and PMDD demonstrate differences in objective sleep characteristics, including lower level of non-rapid eye movement (NREM) sleep stage1, an increase in slow-wave sleep, a reduction in delta frequency during NREM sleep, and a tendency towards diminished sleep efficiency relative to healthy controls; however, not all studies support these observations. Furthermore, self-reported measures indicate that women with premenstrual disorders often report experiencing worse sleep quality, which includes more frequent awakenings, heightened tiredness, and reduced morning alertness.[10] The management of premenstrual symptoms encompasses both medical and non-medical approaches. In contrast to medical treatments, which may present side effects, non-medical interventions tend to be more widely accepted. These non-medical therapies typically consist of dietary treatments along with complementary and alternative medicine practices, including rest, heat application, traditional medicine, lifestyle modifications, meditation and regular physical activity, among others, that are frequently utilized.[11] Numerous recent studies have examined the benefits of Yoga on premenstrual symptoms, primarily due to its convenience, non-invasive nature, minimal side effects, and contribution to overall health. Despite the need for further validation of its effectiveness in alleviating premenstrual symptoms, exercise remains a valuable strategy for managing these symptoms.[12] Engaging in regular moderate exercise can lower cortisol levels, enhance oxygenation, and elevate endorphin production, thereby promoting both physical and mental well-being for women.

The American College of Obstetricians and Gynecologists, along with the National Health Service, suggests that incorporating stretching and breathing exercise, such as Yoga and Pilates, may improve sleep quality and decrease stress during the late luteal phase. Yoga is considered a psychophysical practice. This discipline aids in enhancing concentration, awareness, and physical flexibility, leading to a harmonious integration of body and mind.[13] This review explores Yoga's influence on PMS and PMDD from neuro-physiological, hormonal, inflammatory, and autonomic perspectives.

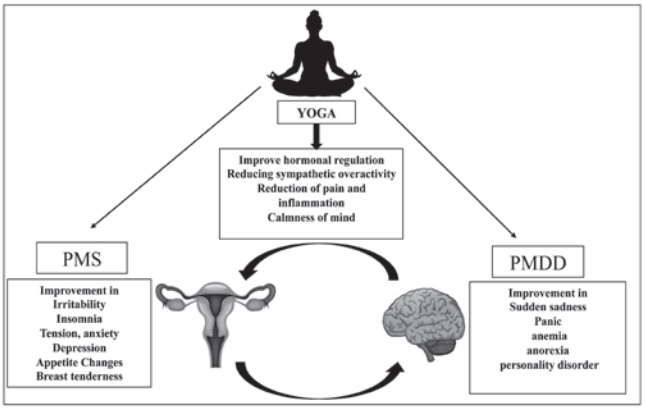

Figure 1. Interaction of Yoga with the Brain-Ovarian Axis in PMS and PMDD.

PHYSIOLOGICAL MECHANISMS: THE POTENTIAL BENEFITS OF YOGA IN PMS AND PMDD

Yoga, an integrative practice encompassing physical postures (asanas), breathing techniques (Pranayama), Kriyas and meditation, has been shown to offer substantial therapeutic effects for managing PMS and PMDD. The mechanisms by which Yoga delivers these benefits are diverse.

Regulation of the hypothalamic-pituitary-adrenal axis (HPA)

Yoga provides advantages for individuals experiencing PMS and PMDD by modulating the hypothalamic-pituitary-adrenal axis and the sympathetic nervous system (SNS). The HPA axis serves as the primary stress response mechanism in the body, functioning as a neuroendocrine pathway that includes the hypothalamus, pituitary gland and adrenal glands. This system is triggered by stressors to release cortisol, known as the stress hormone, which facilitates energy mobilization. The regulation of this process is chiefly governed by CRH, ACTH and negative feedback mechanisms from cortisol itself. Dysregulation of the HPA axis can adversely affect mood, metabolism and immune function and has been associated with chronic stress, depression and neurodegenerative disorders. The increased levels of prolactin or enhanced sensitivity to prolactin, alternations in glucose metabolism, irregularities in the HPA axis, insulin resistance, certain deficiencies in nutritional electrolytes and genetic factors play a significant role in premenstrual syndrome (PMS). Consistent engagement in Yoga practice facilitates the down regulation of the HPA axis which in turn diminishes stress levels and foster relaxation. Such a holistic mind-body strategy is effective in mitigating both the physical and psychological manifestations of these disorders.

Autonomic nervous system (ANS) balance

Yoga serves as a potent non-pharmacological method for alleviating symptoms associated with PMS and PMDD, mainly through the regulation of the ANS. Consistent practice facilitates a transition from a sympathetic nervous system (SNS, "fight or flight") response to a state of dominance in the parasympathetic nervous system (PNS, "rest and digest"). Balancing the sympathetic and parasympathetic is important but PMS and PMDD are correlated with an overactive SNS and reduced PNS reactivity in the premenstrual phase. The amplification of sympathetic activity due to stress results in menstrual pain through a significant increase in the intensity of uterine contractions.[14] Practicing Yoga aids in reestablishing this balance, which contributes to a decrease in heart rate, lower blood pressure, and diminished physiological arousal. Consistent and mild practice, especially in the luteal phase when symptoms generally arise, can yield considerable advancements in the physical and emotional symptoms associated with PMS and PMDD.

Neurotransmitter balance

The relevance of imbalances in neurotransmitters, like serotonin, GABA and dopamine, plays a vital role in the onset of PMS and PMDD. A decline in serotonin levels during the luteal phase has been correlated with various symptoms, including mood swings, anxiety and depression. Furthermore, GABA, recognized for its inhibitory functions, has been identified as having an effect on anxiety and mood disorders, with diminished GABA activity potentially resulting in the symptoms observed in PMS and PMDD.[15] Yoga with physical activity encourages the stimulation of beta-endorphin production and its subsequent release. These endorphins interact with receptors in the brain, promoting feelings of pleasure, reducing stress and lessening pain perception, including headaches and menstrual cramps. Yoga is beneficial in managing PMS and PMDD by triggering the release of endorphins, the body's inherent pain relievers and mood boosters. This neuro-chemical response, combined with the practice's calming effect on the nervous system, helps to alleviate physical pain and enhance mood.[16]

Reduction of prostaglandins and pelvic pain

Naturally occurring prostaglandins, such as those generated in the uterus, have a half-life of merely a few minutes. Enzymes present in the kidneys, liver, intestinal tract and lung rapidly degrade prostaglandins, thereby restricting their effects. The production of prostaglandins in the reproductive system is modulated by the hormones estradiol and progesterone, as well as by catecholamines.[17] Prostaglandins induce constriction of the blood vessels that supply the uterus, resulting in abnormal uterine contractility, which subsequently leads to ischemia, uterine hypoxia, and heightened sensitivity of the nerve endings. Besides the hormonal alterations that take place within the body, various other factors such as dietary habits, the onset age of menarche, stress levels, the duration and intensity of menstrual cycles, as well as the presence of PMS may play a role in the pathological mechanism of PMDD.[18] Primary dysmenorrhea refers to the experience of painful, spasmodic cramping in the lower abdomen that occurs just before or during menstruation, in the absence of any visible macroscopic pelvic pathology.[19,20] Conversely, secondary dysmenorrhea is related to identifiable pathological conditions such as endometriosis, adenomyosis, and fibroids (myomas), and pelvic inflammatory disease and manifest at any time. Yoga is recognized as a form of mind-body medicine and is classified by National Institutes of Health as a type of complementary and alternative medicine (CAM).[21] Yoga has been effective in alleviating the physical symptoms of PMS, including headaches, back pain and abdominal cramps. Certain postures upgrade circulation and facilitate muscle relaxation, potentially alleviating menstrual pain and the severity of PMS-related stiffness. Research indicates that Yoga, exceptionally forms like Hatha Yoga, restorative Yoga and mindfulness-based practices, constructively shrink the intensity of PMS symptoms, resulting in enhanced overall well-being and life quality.[22]

Hormonal regulation (estrogen-progesterone dynamics)

Estrogen and progesterone, which are Gonadal hormones, are vital for maintaining mental health all over a person's life. Apart from their established role in overseeing reproductive functions, these hormones function as neuro-active steroid that affect a wide range of brain activities, such as mood stabilization, cognitive performance, and emotional processing.[23] The link between Gonadal hormones and brain functionally has been systematically examined; suggestive substantial proof that modification in these hormones can greatly affect mental health, particularly

in women who undergo more regular and severe hormonal shifts.[24] Estrogen is repeatedly described as a hormone that display neuro-protective qualities. It improves synaptic plasticity, stimulates neurogenesis and directly influences substantial neurotransmitter systems, such as serotonin, dopamine and GABA. In particular, estrogen affects the serotonergic system by regulating the expression and activity of serotonin transporters and receptors, which are essential for mood stabilization. Throughout the menstrual cycle endometrium undergoes imperative morphological and functional modifications that are critical for uterine attentiveness. These modifications are orchestrated by estrogen and progesterone and concern the sophisticated regulation of diversity of genes, several of which have been found to be epigenetically controlled.[25]

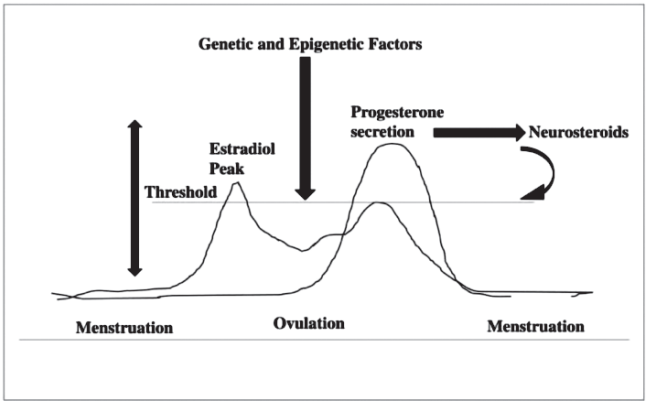

Figure 2. Hormonal variation and genetic- epigenetic factors throughout the menstrual cycle

Inflammation and immune modulation

As a crucial element in PMS/PMDD, stress can stimulate the peripheral immune system, resulting in the secretion of pro-inflammatory cytokines.[26] These cytokines may penetrate the blood-brain barrier (BBB), permitting peripheral immune cells to invade the CNS and instigate neuro-inflammatory responses.[27] In the realm of PMS/PMDD, the interaction between the hypothalamus pituitary ovarian axis (HPO) and the HPA axis is a contributing factor to heightened sensitivity to stress, particularly during the luteal phase when estrogen and progesterone levels fluctuate. This dysregulation exacerbates mood disturbances, irritability, and emotional instability.[28] Additionally, the decrease in these hormones during the luteal phase result in increased inflammation and oxidative stress, which further amplify the symptoms of PMS/PMDD, pro-inflammatory cytokines compromise neuro-protective mechanisms, thereby worsening the severity of the symptoms.[29] In summary, elevated levels of pro-inflammatory cytokines such as TNF-α, IL-1β, IL-6 and IL-8 are observed in women with PMS and PMDD during the luteal phase. This elevation is linked to the fluctuations in hormone levels, particularly the decline in estradiol and progesterone, which can increase inflammation and oxidative stress. This may potentially aggravate mood, pain, and fatigue by affecting neurotransmitters such as serotonin and GABA, as well as brain function, thereby indicating that inflammation is a vital component of pathophysiology.[30] TNF-α (Tumor Necrosis Factor-alpha): In PMS/PMDD, levels are found to be elevated, thereby contributing to inflammatory processes.IL-1β (Interleukin-1 beta) and IL-8 (Interleukin-8): Higher concentrations are noted, which are positively associated with the severity of symptoms, especially in terms of mood and pain experiences. IL-6 (Interleukin-6): This interleukin is similarly elevated, demonstrating an inverse correlation with sex hormone levels. C-reactive protein (CRP): This nonspecific marker of inflammation is commonly detected at higher concentrations during the luteal phase in women with premenstrual symptoms, notably those pertaining to mood and pain.[31] Incorporating Yoga into one's routine can help alleviate these symptoms by reducing inflammatory cytokines, lowering oxidative stress, fostering improved mood, lessening fatigue and decreasing pain perception. Ongoing research suggests that mind-body practices, including Yoga are a valuable strategy for managing the physical and emotional associated with PMS and PMDD.[32]

Sleep and circadian rhythm regulation

Sleep disturbances are prevalent among women, with instances of insomnia reported at 1.5 to 2 times the rate seen in men.[33] In fact; sleep-related issues frequently arise during the postovulatory luteal phase (LP) in healthy females. The disrupted sleep and circadian rhythms have been linked to a higher incidence of lifestyle diseases like obesity,[34] diabetes cardiovascular disorders. Moreover, depression is more common in such individuals, considering that depression is already more common in women, it is crucial to explore how neuroendocrine fluctuations throughout the menstrual cycle interact with circadian physiology and contribute to the increased vulnerability to sleep disturbances in women. At particular times of the day, for instance, just before the regular bedtime when the homeostatic drive for sleep reaches its zenith, and conversely at the end of the sleep cycle when it is at nadir, a robust circadian drive for wakefulness and sleepiness, respectively, counterbalances process S (Homeostatic sleep drive). This interaction, termed the 'opponent processes, results in uninterrupted 8-hour nocturnal sleep and 16 hours waking intervals each day. Process C (Circadian rhythms or biological clock i.e., internally generated biological rhythms of approximately 24 hours are evident in numerous aspects of human physiology and behavior, including neuroendocrine secretion, sleep propensity and architecture, along with subjective and EEG-based evaluations of alertness (Figure 3). Sleep parameters, including sleep onset latency, sleep efficiency, rapid eye movement sleep, REM sleep onset latency, and spindle frequency activity (SFA; spectral power density within the 12-15 Hz range), and demonstrate a pronounced circadian modulation.[35] A disrupted or insufficient circadian rhythm of melatonin secretion has been put forward as a potential cause of excessive daytime sleepiness and depressive symptoms in PMS/PMDD.[36] The practice of Yoga has been shown to diminish sleep disturbances among subjects suffering from PMS/PMDD which in turn has led to an improvement in their sleep efficiency. Thus, studies suggest that Yoga could be utilized as a therapeutic approach for addressing sleep disturbances in women with PMS/PMDD, although more severe cases may require medical treatment.[37]

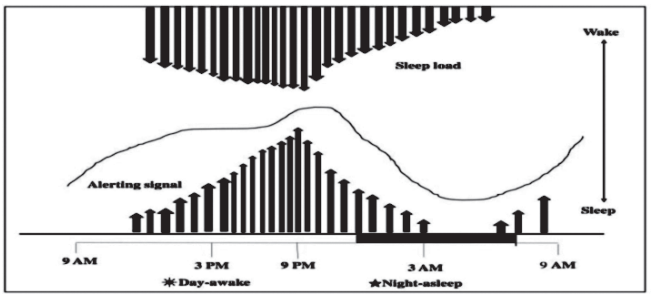

Figure 3. The circadian and homeostatic sleep drive alerting mechanisms in human sleep-wake regulation

RESEARCH FINDING ON EFFECT OF YOGA ON PREMENSTRUAL SYMPTOMS

Further analysis highlights the potential of Yoga as an effective non-drug intervention for alleviating the symptoms associated with PMS/PMDD, encompassing both physical discomfort and psychological distress (Table 2).

YOGA IN ADOLESCENTS

PMS and PMDD is a widespread pain issue among adolescents girls, characterize by its independence from other pathological conditions. In the domain of adolescent's sexual and reproductive healthcare, professionals view PMS and PMDD as a recurring pain issue that can be temporarily managed with medication; nevertheless, the persistent pain and monthly discomfort have a profound impact on the lives of these young individuals. Yoga as a complementary therapy can play a significant role in educating and adding the management of menstrual pain, ultimately improving quality of life. An analysis of 39 trails on Yoga in schools found them beneficial for health. Integrating Yoga and mindfulness into school routines can promote overall well-being.[46] Specifically, Yoga can aid adolescent girls with menstrual issues; this approach can have lasting benefits for their health as they transition into adulthood. Early investment in this area can offer long-term rewards.

Table 2. Summary of recent randomized and controlledtrials (2016-2025); The effect of Yoga on PMS and PMDD

Author(years)	Purpose of the study and sample size	Yoga intervention	Main Findings
Tasi SY; 2016[38]	Parallel-group RCTs of Yoga for PMS among female employees. (n=64, 20-45 years age)	Hatha Yoga, Kapalbhati Pranayama, and Yoga breathing exercises-12 weeks	In this study, it was found that female employees who did Yoga exercise reported a lower level of PMS, related to a lower risk of menstrual discomfort.
Kamalifard M et.al; 2017[39]	RCTs of Yoga intervention for females with PMS. [n=62; Experimental groups (EG) 31 and control group (CG) 31]	Yoga (asana, breathing, relaxation)-10 weeks	This study suggests that Yoga is a safe and secure treatment for PMS. Yoga can be prescribed for PMS.
Lata P and Lohan U; 2018[40]	This study was to evaluate the effect of Yoga on women with PMS. (n=60, EG:30,CG:30; 17-28 years of age)	Aerobictraining-10 weeks	This study concluded that exercise can be an effective treatment for PMS.
Ghaffarilaleh G, et.al; 2019[41]	RCTs of Yoga on women with PMS and suffering from depression during that time. (n=62)	Yoga (Shaw asana)-10 weeks	This study concluded that Yoga can be used as a alternative remedy for women with PMS. Yoga has a positive effect on depression symptoms.
Sahu R & Barnwal SL; 2022[42]	RCTs to evaluate the effect of Yoga on women with PMS. (n=60, EG:30, CG:30; 14-17 Years of age)	Different types of asanas, Pranayama-10 weeks	This study highlights that Yoga is a safe treatment for it reducingcognitive,behavioural, somatic and psychological symptoms of PMS.
Chang HC et al; 2023[43]	Cluster randomised trial of Yoga effect on women with PMS. (n=128, EG:65, CG:63)	Yoga (Pranayama, Asana, Dhyana)-12 weeks	This study suggests that Yoga may effectively reduce PMS, which includes physical pain, anger, irritability and depression.
Abic A er. al; 2024[44]	RCTs of the effect of Yoga on women with PMS and the depression, anxiety and stress associated with it. (n=68, EC:51, CG:17)	Yoga(Asana,Pranayama, Relaxation)	This study suggests that Yoga is a beneficial and secure treatment for PMS and depression, anxiety, and stress.
Gonmei et.al; 2025[45]	RCTs of the impact of different types of Yoga on relieving the symptoms of PMS among young adult females. (n=60, EC:30, CG:30; 17-25 years of age)	Nadishodhana, Bhramari Pranayama, Yoga Nidra-8 weeks	This study showed that different types of Yoga for 8 weeks improve health and showed a positive result on women with PMS.

YOGA VS. AEROBIC EXERCISE

Aerobic exercise increases endorphins, dopamine and opiate peptides, while inhibiting the release of prostaglandins and increasing the estrogen-estradiol ratio, which serves to reduce endometrial proliferation, reroute blood flow, improve mood and potentially alleviate PMS and PMDD symptoms in women.[47] Yoga is presently endorsed as a noninvasive technique and an easily accessible intervention for pain management, noted for its safety and affordability, with minimal or no side effects. Furthermore, regular Yoga practice has favorable implications for the menstrual cycle and psychobiological wellness, likely by harmonizing the neuroendocrine axis. Yoga alleviates the negative consequences of stress on the immune system by positively modulating immunoglobulin A levels and reducing harmful inflammatory responses, which enhances comfort for women suffering from PMS and PMDD.[48] It is concluded that both aerobic exercise and Yoga movements are effective in treating PMS and PMDD; however, Yoga is more effective in relieving the symptoms of PMS and PMDD than aerobic exercise (Table 3).[49]

Table 3. Comparative analysis of physiological and psychological benefits: aerobic exercise vs. yoga

Symptom/ Category	Aerobic exercise benefits	Yoga benefits
Physical symptoms	Markedly lessens the degree of pain, cramps, bloating and backache.	Substantially alleviates the severity of pain, cramps, abdominal distension and breast sensitivity.
Mood and emotional symptoms	Enhances emotional well-being, alleviates stress, anxiety and depressive symptoms through the release of endorphins.	Indicates marked improvement in mood, irritability, fatigue, anxiety and depression as a result of activating the parasympathetic nervous system.
Physiological mechanisms	Boosts aerobic capacity and improves blood flow, could potentially raise serum progesterone levels.	Inhibits the functioning of the HPA axis, diminishes heart rate and encourages relaxation by means of alpha brain wave activity.
Overall efficacy	Very effective in the management of PMS and PMDD.	Studies suggest that Yoga may be more effective than aerobic exercise for certain symptoms but the findings are of mixed type.

So, this narrative review draws upon diverse epistemic enterprises including physiology, neuroscience, endocrinology and Yogic practices, acknowledging the cumulative and interconnected nature of scientific knowledge production[50] and suggests that Yoga is an effective method that can improve women's quality of life, providing an alternative to medications for PMS and PMDD.

CONCLUSION

Menstruation is an entirely natural physiological process, and PMS and PMDD are highly prevalent conditions that significantly impair physical discomfort, emotional stability, and overall quality of life. Scientific evidence suggests that practicing Yoga regularly has a promising role in producing beneficial physical and psychological outcomes. The evidences analyzed in the present study indicate that Yoga is a safe, cost-effective, and holistic non-pharmacological intervention for the management of these conditions in women of reproductive age and the key physiological pathways include the hypothalamic-pituitary-adrenal axis, autonomic nervous system balance, neurotransmitter regulation, inflammatory responses, hormonal dynamics, and circadian rhythms. So, Yoga is a highly impactful alternative strategy for the management of PMS and PMDD that can be adopted in daily life, with substantial benefits for physical health, psychological resilience, and quality of life.

FUTURE DIRECTIONS

The future research should develop and validate specific, consistent Yoga protocols through well designed active clinical trials. Future studies aim to identify effective Yoga sequences and breathing techniques for alleviating PMS and PMDD symptoms, potentially leading to standardized protocols endorsed in clinical guidelines, offering Yoga as a treatment option supported by reliable data.

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